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ABSTRACT

The differences between computer use and gender were investigated at a rural island junior/senior high school with a majority of Pacific Island students. The school is located on the island of Tinian in the Commonwealth of the Northern Mariana Islands. During a 9-week period, students recorded the amount of time and what they were using the computer for on sign-in sheets. Four computers located in the resource center, in the counselor's office, were used for the study. From an analysis of the sign-in sheets, it was learned that there were no differences between the amount of use of these computers and the student's gender. It was found, however, that female students did more word processing than male students. Female students seemed to use computers more often than male students, but this difference was not statistically significant. Problems with using student sign-in sheets appeared. Many students did not completely fill in all items on the sheets. In a future study, software should be used to monitor student computer use. Results of this study are in line with other studies that have shown that female students do more word processing than male students, and that the educational use of technology may be becoming more equitable in the United States. (Contains a table and 25 references.) (Author/BT)

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Gender and Computer Use at a Rural Island School

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Abstract

The differences between computer use and gender were investigated at a rural island junior/senior high school with a majority of Pacific Island students. This school is located on the island of Tinian, in the Commonwealth of the Northern Mariana Islands. During a nine-week period, students recorded the amount of time and what they were using the computer for on sign-in sheets. Four computers located in the resource center, in the counselor's office, were used for this study. From an analysis of the sign-in sheets, it was learned that there were no differences between the amount of use of these computers and the gender of the student. However, it was found that female students did do more word processing than male students. Also, female students seemed to use computers more often than male students, but this difference was not statistically significant. Problems with using student sign-in sheets are also discussed in this report. The results of this study are in line with other studies that have shown that female students do more word processing than male students and that the educational use of technology may becoming more equitable in the United States. Implications of culture and its affect on gender differences are also discussed in this paper.

Gender and Computer Use at a Rural Island School

Gender differences are a part of every society. These differences cannot be ignored because they are part of every person's life. Parents, educators, peer groups, and mass media promote values that have the effect of causing many of the differences in gender that we see in society (Shashaani, 1994). Educational institutions reflect the gender differences found in society (Makrakis & Sawada, 1996). Educators must be aware of these gender differences and find methods to overcome them, or at least try to reduce the influence of gender as much as possible, so that each student has a fair and equal opportunity to receive an education. Because of the increasing role technology plays in education, educators need to be aware of the gender stereotyping of technology and the differences in how male and female students view and use technology.

Technology is viewed by many as a male domain (Shashaani, 1994; Knupfer & Rust, 1997; Knupfer, 1997; Hanson, 1994). The newer the technology, the more masculine it is viewed (Shashaani; Knupfer & Rust). As the technology becomes more familiar, the more it is seen as belonging to both genders, male and female. Currently, the Internet, being newer educational technology, is viewed as being dominated by males, but this view is gradually changing (Hanson). The question that needs to be answered is; are the use of computers and the Internet really dominated by one gender or the other? This question needs to be answered so that educational institutions can best use their limited resources to make sure each student receives a fair and equal education.

The purpose of this study is to provide information that may help answer the aforementioned question. This study was conducted to determine if there is a difference in how computers are actually used by male and female students in a non-classroom

environment. This study was conducted at a small rural junior/senior high school in the Commonwealth of the Northern Mariana Islands, on the island of Tinian, where I am currently an instructor. The computers in the resource center, located in the counselor's office, were used for the collection of data. A sign-in sheet was located at each computer in which students recorded their gender, the amount of time they used the computer and what they were using the computer for. From this data, it is hoped that some insight can be gained about the relationship between gender and the use of technology for education outside the classroom environment.

Review of the Literature

A review of the literature on educational technology and its relationship to gender indicates that very few studies have actually looked at students using technology in their overall daily educational activities. Most studies either looked at the attitudes of students toward computers (for example, Copper & Stone, 1996; Woodrow, 1994; and Shashaani, 1994), relied on the results from surveys (for example, Owens & Waxman, 1998; Rocheleau, 1995; Yaghi, 1997; and Robertson, Calder, Fung, Jones, & O'Shea, 1995), or both. The studies that do look at actual computer usage in education are mainly concerned with how students perform after computer-assisted instruction is given (Grignon, 1993; Erdner, Guy, & Bush, 1998), or on some specific computer task (Joiner, Messer, et al., 1998; D'Amico, Baron, & Sisson, 1995; Corston & Colman, 1996). Some studies focused on learning in specific subject areas, such as language arts (Levine & Donistsa-Schmidt, 1995), or science and mathematics (Owens & Waxman; Dugdale, DeKoven, and Ju, 1998). In the review of the literature, no study was found that actually

tracked student usage of computers to discover if there is a relationship between gender and the use of computers for educational tasks outside of the classroom.

The relationship between gender and computers is still undetermined. D'Amico et al. (1995) found that female students benefited from more exposure to computer-assisted learning in one study, but in a second study, reported in the same article, no gender difference was found. D'Amico et al. goes on to state that the superior performance of female students may be attributed to the assigned language task, which they felt females are better at. Yaghi (1997) states that "Research findings seem to be inconstant in regard to the relationship of gender and attitudes toward computers" (p. 239). He goes on to state that some studies indicate that males have more favorable attitudes toward computers, while others report little or no difference. Both Reinen and Plomp (1997) and Woodrow (1994) found that males have a more positive attitude towards computers than females, but at the same time, Robertson et al. (1995) and Yaghi found no differences. Robertson et al. found that levels of experience must be considered while comparing attitudes about computers and gender, because the more experience a student has, the more positive his or her attitude towards computers will be. The research shows no clear answer on how gender is related to student attitudes toward computers, which can affect how students use computers for their education.

Doornekamp (1993), Owens and Waxman (1998), Shashaani (1994), and Dugdale et al. (1998) reported that male students used computers more often than female students did. It was reported that male students used computers more often at home (Dugdale et al., 1998) and for more time at school (Shashaani) than did female students. While Rocheleau (1995) reported that male students were more likely to be heavy computer

users in 1987, by 1992 there was no significant difference between the genders of heavy computer users. Dugdale et al. also found that neither access to a home computer or gender had any effect on the overall improvement in performance after completing a computer-assisted instruction program. It would seem that males use computers more often than females because they have more access to computers at home and in school, but for computer related tasks this had little effect on their overall improvement in performance.

At the same time, there is some indication that home ownership of computers, because males are more likely to have greater access to home computers, does account for some of the gender differences found in the educational use of computers (Robertson et al., 1995; Yaghi, 1997; Reinen & Plomp, 1997). However, Shashaani (1994) cautions that, "Buying a computer for the home does not guarantee that students, especially females, will be motivated to become familiar with it, use it, and enjoy working with it" (p. 361). In summary, having access to a computer seems to improve a student's attitude about computers, but not their overall performance on computer related tasks, and it might even increase gender differences because male students have greater access to home computers.

Two possible explanations for the differences found in the literature, concerning the relationship between gender and technology, may be culture and gender/audience relationships. Yaghi (1997) reported that male children in Lebanon are given more opportunities and better access to computers in the home because there is a cultural preference toward male children. He also found that in the United States ownership was not important when comparing gender and attitudes about computers, as it was in

Lebanon. Reinen and Plomp (1997) found that computer use by students in the United States and Bulgaria is more gender equal than in Austria, Germany, Japan, Latvia, and Slovenia, because in both the United States and Bulgaria the use of female staff in education is more common than in the other countries. In addition, they found that in the United States there was more equality in the home ownership of computers. When looking at the relationship of gender to technology the social context of gender must be considered because of the influence it may have on this relationship.

When doing studies on gender, how the students are placed in groups must be carefully considered. Joiner et al. (1998) found that in performing a computer task females in same-sex groups with low expectations were at a disadvantage when compared to other groups. While Copper and Stone (1996) found that group gender composition had no effect on performance or motivation, but that females in the presence of males were more likely to underestimate their knowledge and computer experience. Robertson et al. (1995) found that gender groupings had an influence on how much a student will explore the different features of a program. Females were less likely to explore in the presence of males than in the presence of other females. At the same time, males were more likely to explore the program's features in the presence of a female audience than in the presence of an all-male audience. Corston and Colman (1996) also found that females performed significantly better in front of a female audience than either alone or with a male audience. The grouping of students needs to be carefully considered when reading or conducting studies concerning the relationship between gender and the use or attitudes toward technology. Both the culture and the grouping of subjects could

help to account for some of the inconsistencies of the results found in the research on the relationship between gender and technology.

Along with the indicated difference between male and female students based on attitudes toward computers or on having access to computers, there also seems to be an indication of a difference in how each gender actually uses computers. Lee (1997) found that adults varied in the kinds of software that they used and that this difference was gender related. Makrakis and Sawada (1996) state that female students have a greater appreciation for writing and language activities and have a lesser liking for math and science. This may explain why Reinen and Plomp (1997) and Shashaani (1994) reported that female students do more word processing than male students. At the same time, however, Levine and Donistsa-Schmidt (1995) reported that males do more word processing than females, in Israel, because they have a higher degree of home ownership of computers. Grignon (1993) also found that males are more likely to play computer games and use graphics software than females. In secondary education, the main use of the computer seems to be word processing (Dugdale et al., 1998; Shashaani). It would seem that female students are more likely to use a word processor, while male students are more likely to play computer games and use graphic software when using computers, but overall, word processing will be the most common use of the computer by both genders.

In summary, the literature seems to indicate that there is a difference between gender and attitudes toward computers, between gender and access to computers, and the types of programs used each gender uses. The literature on the relationships between gender and computers would seem to indicate the following:

- Males are more likely to have a more positive attitude towards computers than females.
- Males are more likely than females to have access to computers, both at school and at home.
- Males are more likely to use graphic software and computer games than females, while females are more likely to do word processing.

But as stated above, the social context should be kept in mind when comparing relationships between gender and technology. Society has a large influence on how we relate to each other and to the objects in our environment.

Methodology

This study was conducted at Tinian Junior/Senior High School, a small rural school located on the island of Tinian, in the Commonwealth of the Northern Mariana Islands. The population of Tinian is approximately 3,000 people (Tinian High School, 2000). Tinian is a small island that is about 11 miles long and five miles at it widest point. It is located south of Saipan, the capital island of the CNMI, separated by a three-mile wide channel. The main forms of transportation between Tinian and Saipan are small commuter airplanes and a ferryboat. When both the waiting and travel time are considered, it can take over an hour to travel between Saipan and Tinian. Because of the difficulty and cost involved in traveling, many of the students at Tinian Junior/Senior High School have never been off Tinian and the majority of students have never been out of the Mariana Islands.

Tinian Junior/Senior High School has a student population of 256 students, from the seventh grade to the twelfth grade, with a 94 percent average daily attendance. The

majority of the students are of Pacific Islander ancestry (89%), with the majority being Chamorro (88%). There is also a mixture of other Asian ethnic groups, Filipino (6%), Korean (4%), and Chinese (.4%) (Tinian High School, 2000). The student body of Tinian Junior/Senior High School is composed of 142 male and 114 female students. All students had access to the computers used in this study.

The computers used for this study are located in the school counselor's office, which is also a student resource center. Students have access to these four computers before, during, and after school. These computers run the Windows 98 operating system, with Office 97, AppleWorks 5, and educational and research databases available for student use. Only one of the computers has access to the Internet. These computers are in constant use by students during the school day, but are not available when the counselor is not in her office. The counselor's office was chosen for this study because of its availability to all students, and also in an effort to reduce the effects that an audience or teacher may have on the relationship between gender and the use of the computers in a classroom (Volman, 1997; Copper & Stone, 1996).

To collect data for this study, a sign-in sheet was kept at each computer. This was a self-reporting sign-in sheet, in which the student wrote their name, starting time, ending time, gender, program used, and purpose for using the computer. The reason for listing both the program used and the purpose of use was to ensure that what each student was using the computer for could be determined for data interpretation purposes. Students were encouraged by both the counselor and me to fill in the sign-in sheets on a regular basis. Data was collected for nine weeks, from February 3, 2000 to April 3, 2000. The

sign-in sheets were collected after they were completely filled, which was usually every two or three days.

The purpose of conducting this study was to discover, in an actual educational situation, if there was a gender difference in the use of computers, in the amount of time the computers are used, and the types of programs used. From a review of the literature, it is expected that male students will use the computers more often and for longer periods of time than female students. It is also expected that a difference will be found in which programs are used by male and female students. Male students will use games and the Internet more often than female students, while female students will do more word processing. Finally, the data will be analyzed to determine if there is any relationship between gender and which students used the computer the most often.

Results

Out of the total student population, 89 different students used the computers in the counselor's office during this study. This is 34.8 percent of the total student population at Tinian Junior/Senior High School. Of the total number of students who used the computers, 46 were female and 43 were male. This was found to be not statistically significant by using a chi-square test, x^2 (1, N = 89) = 1.63, p = .201. These 89 students used the computers 430 times. The computers were used by female students 210 times and by male students 220 times. Again, this difference was not statistically significant, x^2 (1, N = 430) = 3.40, p = .065.

Each computer use, by the students, was placed into one of six categories; blank, databases, games, Internet, spreadsheets, and word processing. See Table 1 for the number of times the computers were used for each category and the number of individual

students in each category. When a student did not enter both a purpose for using the computer and what program they were using, the use was recorded as "blank." Only 41 uses (9.5%) could not be determined and were recorded as "blank." Word processing was the most common use of the computers by the students. The computers were used 180 times for word processing by 66 different students. Word processing was done by 74.2 percent of the students that used these computers. The next most common use was accessing the Internet, 148 times by 33 different students. The rest of the use categories are as follows: databases 39 times by 26 students; games 22 times by 11 students; and spreadsheets 11 times by 5 students.

When the relationship between gender and the number of times the computers were used for the six different categories was analyzed, statistically significant differences were found between gender and all categories, except for Internet and databases. However, when the number of individual users for each category was compared to gender, only word processing was found to have statistical significance. Female student were more likely to do word processing (x^2 (1, N = 174) = 17.43, p = .000) than male students, and more individual female students used a word processor (x^2 (1, N = 66) = 3.94, p = .047) than did individual male students. Female students were also more likely to use spreadsheets (x^2 (1, N = 11) = 5.87, p = .015) and play games (x^2 (1, N = 22) = 4.58, p = .032) than male students. However, there was no statistically significant difference between the number of individual students using the computers to work with spreadsheets or play games when compared with the gender of the student.

Male students left the purpose for using the computers blank more often than female students. There was a statistically significant difference found between gender

and leaving the reason for using the computer blank, x^2 (1, N = 41) = 9.05, p = .003, but no statistical significance based on the number of individual users and gender was found, x^2 (1, N = 23) = .71, p = .400. It would seem that certain male students were less conscientious in signing in and out while using the computer. One hundred seventeen males did not completely fill in either the starting or ending time while using the computer compared to 94 females, but this difference is not statistically significant, x^2 (1, N = 211) = 1.54, p = .215.

No statistically significant difference was found in both the number of times students accessed the Internet (x^2 (1, N = 143) = 2.27, p = .132) or used a database (x^2 (1, N = 39) = 4.34×10^{-14}, p = 1.00) when compared to the gender of the students. There was also no statistically significant difference based on the number of individual students using the Internet (x^2 (1, N = 33) = .12, p = .727) or databases (x^2 (1, N = 39) = 4.34×10^{-14}, p = 1.00) when compared to gender.

There was a problem with the reporting of the amount of time that each student used the computers for a task. Only 219 (51%) of the total 430 times the computers were used by students had both the staring and finishing times reported. There was no statistical difference for the amount of time that the students used the computers when compared to gender, x^2 (1, N = 97.86 hours) = 2.82, p = .093. However, female students did use the computers for a larger amount of time than did the male students. Female students used the computer for 51.83 hours as compared to 46.03 hours for male students. In addition to no statistically significant difference for the total amount of time each gender used the computers, there was also no difference found for any of the six

categories, used to record how the computers were used, when the amount of time for each category was compared to gender.

There did seem to be a small group of students who dominated the use of the computers. This group of users was comprised of six male students and eight female students. The male students used the computers 107 times, 24.9 percent of the number of uses of the computers. The female students used the computers 108 times, 25.1 percent of the number of uses of the computers. These fourteen students comprise only 15.7 percent of the total number of individuals that used the computers, but they account for 50 percent of the total number of times the computers were used. When comparing the gender of these users to the expected number of heavy users for each gender there was no statistically significance difference, x^2 (1, N = 14) = 1.17, p = .280.

Discussion

One of the surprising results of this study was the lack of differences when gender was compared to the student use of the computers and the Internet at Tinian Junior/Senior High School. The results of this study are supported by a study conducted by Joiner et al. (1998) on student performance while engaged in a computer mathematics task, and a survey by Dugdale et al. (1998) to determine how students used computers in their homes. Three factors may have contributed to the equitable use of computers at Tinian Junior/Senior High School. These three factors are that the United States may be more equitable in educational computer use than other countries, that Tinian Junior/Senior High School has female role models using computers, and finally, that Chamorro culture is matrilineal.

Studies that have compared computer use or attitude towards computers with gender in different countries have found that the United States is one of the more equitable countries (Yaghi, 1997; Reinen & Plomp, 1997). Yaghi states that when gender is compared to ownership of computers, the United States is much more equitable than Lebanon, because Lebanese cultural places an emphasis on male children, much more so than does American culture. Reiner and Plomp believe that the United States is more gender equitable, when compared to European countries and to Japan, because of the more equitable access to home computers by males and females, as pointed out also by Yaghi, and by having more female role models in schools.

In the area of female role models, Tinian Junior/Senior High School supports Reiner and Plomp's (1997) findings. There are four female staff members whom the students regularly see using computers. They are the counselor, the main office secretary, the library aid, and the business teacher. The only male role models whom the students see using computers are the computer science teacher and the Junior ROTC instructor. These role models may have an influence on how the students perceive the relationship between gender and the use of computers. This student perception may be reflected in the results of this study, which showed no gender difference in the amount of uses by students of the computers.

The last factor that may have resulted in the equitable gender use of computers at Tinian Junior/Senior High School is the Chamorro culture found on Tinian. The traditional Chamorro culture is matrilineal, with women having substantial authority in the society (Farrell, 1991). Rank in the Chamorro clans was based the seniority of women along a direct line of descent of the first-born females in a clan (Farrell). The

seniority and authority of women is still an important and respected part of Chamorro culture today, with the eldest woman of the family clan controlling many of its important functions. With students of Chamorro ancestry making up almost 90 percent of the student population on Tinian, female students may be encouraged to take an active role in their education. The expectations of the Chamorro culture for women may encourage a more gender equitable situation in regard to computer usage at Tinian Junior/Senior High School.

The cultural influences found on Tinian may also help to explain the results found in how the computers were used by the students. Female students were at or exceeded the expected number of uses for all categories, except for the blank and Internet categories. Only in the use of games, spreadsheets, and word processing were female students significantly different from male students. The findings for games and spreadsheets may not really show statistical significance because of the low number of individual users. For a chi-square test to be valid, Lane (2000) states that the number of subjects must be at least ten. The number of users for spreadsheets was five, and for games, it was eleven. The low number of users for these two categories might make the chi-square test invalid.

This study's finding for games is in direct contradiction to other reported studies. Shashaani (1994) and Dugdale et al. (1998) found that male students used computers much more often to play games than female students. Besides the statistical problem, there may be two reasons why it was found that female students played games more often then male students. The first reason may have to do with the selection of available games on the computers in the counselor's office. Only the games that come with the Windows

98 operating system are available. These are mainly card playing games, and they may be more appealing to female students than male students. The second reason is that many students may not have reported that they were playing games on school computers for fear of getting in trouble. Through personal conversations with students, I was able to learn that this was a very real possibility. Many students said that they did not report playing games on the computer sign-in sheets because they were afraid that they would get in trouble. More research is needed to see if available games and fear of getting in trouble has an influence on the use of computers by male and female students.

Regarding the student use of the Internet, the results of this study were not as expected after a review of the literature. It was expected that significantly more male students would use the Internet than would female students, but instead there was no statistically significant difference based on gender. These results are not in agreement with other studies that have shown that male students use the Internet more than female students (Robertson et al., 1995; Reinen & Plomp, 1997). There may be two possible explanations for the results obtained in this study. First, the Internet may not be as male dominated (Hanson, 1994; Knupfer, 1997) as it used to be. The use of the Internet may be more gender equitable today than when it was first introduced to the public over ten years ago. The second reason has to do with the lack of resources for research on Tinian. There are two small libraries on Tinian that the student can use, one at the junior/senior high school and the other at the local branch of the junior college. Each library is about the size of a standard school classroom, with a very limited selection of books. When students have to do a paper for class they turn to the vast resources available on the Internet. The students see the Internet as a tool to help in their research. Because both

female and male students have the same expectations for using the Internet in research, these similar expectations, as pointed out by Joiner et al. (1998), may help to minimize the differences between gender and the use of the Internet at Tinian Junior/Senior High School.

As for using computers to do word processing, this study does support the findings of other studies. Makrakis and Sawada (1995) reported that female students liked language classes the most, when compared to other subjects. D'Amico et al. (1995) found that female students do better on computer language tasks than male students. Finally, Reiner and Plomp (1997) and Shashaani (1994) both reported that female students used computers for word processing more often than male students did in secondary education. This study found similar results. Female students used word processors more often than male students, and more individual female students did word processing than individual male students. Both of these findings were statistically significant using a chi-square test.

The results obtained in this study for the most frequent computer users supports the change in computer usage that was noted by Rocheleau (1995) for power users. Power users are the students who use the computers the most. Rocheleau found that in 1989 power users were mainly males. By 1992, there was no gender difference found in the power user group. This study also found no difference based on the gender of the students who use the computers the most often.

A major problem that was encountered during this study was the use of the self-reporting sign-in sheets to record computer use data. Many students did not completely fill in all items on the sign-in sheets. Only 51 percent of the entries were completed for

both the time in and time out sections, which were used to calculate the amount of time each student used the computer. Blank entries for the purpose of the use of the computers by the student and what program they were using accounted for 9.5 percent of the amount of the uses for the computers. Also, many students stated to me that they did not sign-in while using the computers because they either forgot or were just using the computers for a short period of time. If a similar study is conducted in the future, it is recommended that software be used to monitor the students' use of the computers. This way the data will be more complete and accurate than when using student sign-in sheets.

Two further areas of research that should be done, to determine if the results of this study are valid, are to look at how the students are using all of the available computers at school and to determine how the students are using their home computers for educational purposes. Students do not only use the computers in the counselor's office for schoolwork. Other computers are also available for student use in the computer lab, the Junior ROTC office, and the business skills classroom. A study could be done to include these computers so that it could be determined how students are using all of the available computers at the school for educational purposes. Also, because of the small student population size at Tinian Junior/Senior High School and the isolated nature of Tinian, it could be easy to conduct a survey of home computer owners to determine how students use these computers for education. If the use of all computers, both at the school's campus and home computers, are included in a study, one has to wonder if the lack of differences based on gender and computer use, except for word processing, would still be found?

The results of this small study indicate that there is equitable use of computers among female and male students at Tinian Junior/Senior High School. At the same time, there is an indication that female students may be using computers more than male students. The more frequent use of computers by female students may be a reflection of the importance which Chamorro society places on women as authority figures in family clans. Culture and the interaction between male and female students must always be in a researcher's mind as he or she explores the use of technology for education and its relationship to the student's gender.

Because of the increasing use of technology in business, we must prepare all of our students for the future challenges that they will meet. We must ensure that all students have access to and the use of technology while in school. As Owens and Waxman (1998) pointed out, "One of the major challenges in education is to ensure that all students are prepared for today's more technologically advanced world. This means that all students should have access and use of technology in schools" (paragraph 2). At least at Tinian Junior/Senior High School, both male and female students do seem to have equal access to computers. Now, more access to both computers and the Internet is needed so that the students will be prepared to meet the challenges that they will face after leaving school.

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Table 1

For each category group, the number of times the computers were used and number of individual students using the computers by gender

Category	Male	Female
Blank		
Number of Uses	32	9
Number of Individual Users	15	8
Databases		
Number of Uses	22	17
Number of Individual Users	14	12
Games		
Number of Uses	7	15
Number of Individual Users	5	6
Internet		
Number of Uses	88	55
Number of Individual Users	18	15
Spreadsheets		
Number of Uses	2	9
Number of Individual Users	2	3
Word Processing		
Number of Uses	69	105
Number of Individual Users	29	3